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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/994,114	11/26/2001	Michael Griebel	MMG-110	8274

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EXAMINER	
CHANDLER, SARA M	

ART UNIT	PAPER NUMBER
3693	

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08/20/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	09/994,114	GRIEBEL ET AL.	
	Examiner	Art Unit	
	Sara Chandler	3693	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 June 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

This Office Action is responsive to Applicant's arguments and request for reconsideration of application 09/994,114 (11/26/01) filed on 06/26/07.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Traub, Pat. No. 5,940,810 in view of "Numerical Integration Using Sparse Grids," by Thomas Gerstner and Michael Griebel and communicated by C. Brezinski (1998) pgs. 209-232 (hereinafter Gerstner).

Re Claims 1-11: Traub discloses a method for valuation of financial derivatives, wherein a value of a derivative is computed by a determination of an expectation, the method comprising:

inputting a plurality of input parameters of the derivative to at least one processor and establishing an integrand as a function of the input parameters (Traub, abstract, Figs. 1-6; col. 1, line 1 – col. 6, line 36);

computing a multivariate integration domain (Traub, abstract, Figs. 1-6; col. 1, line 1 – col. 6, line 36);

applying a numerical technique to determine a plurality of integration points and a plurality of integration weights as a function of the input parameters (Traub, abstract, Figs. 1-6; col. 1, line 1 – col. 6, line 36);

evaluating the integrand inside an integration domain at the integration points to determine a plurality of integrand values (Traub, abstract, Figs. 1-6; col. 1, line 1 – col. 6, line 36);

computing an expectation by combining the integrand values and the integration weights and determining a value of the derivative from the expectation (Traub, abstract, Figs. 1-6; col. 1, line 1 – col. 6, line 36);

and outputting the value of the derivative (Traub, abstract, Figs. 1-6; col. 1, line 1 – col. 6, line 36).

Traub fails to explicitly disclose wherein the numerical technique is a sparse grid.

Gerstner disclose wherein the numerical technique is a sparse grid (Gerstner, pgs. 209-232).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Traub by adopting the teachings of Gerstner to provide wherein the numerical technique is a sparse grid. As suggested by Gerstner, in certain fields (i.e., such as the valuation of derivatives) that use multivariate integrals the use of sparse grids helps to overcome the 'curse of the dimension' (i.e., computing costs growing exponentially with the dimension of the problem).

Re Claims 12-18: Traub discloses a device for valuation of financial derivatives, wherein a value of a derivative is computed by a determination of an expectation, the device comprising:

an input unit communicating a plurality of input parameters of the derivative to a computer (Traub, abstract, Figs. 1-6; col. 1, line 1 – col. 6, line 36);

the computer comprising a setup module establishing an integrand as a function of the input parameters and computing a multivariate integration domain, a discretization module applying a numerical technique to determine a plurality of integration points and a plurality of integration weights as a function of the input parameters, and an integration module evaluating the integrand inside an integration domain at the integration points to determine a plurality of integrand values and computing an expectation by combining the integrand values and the integration weights (Traub, abstract, Figs. 1-6; col. 1, line 1 – col. 6, line 36); and

an output unit communicating a value of the derivative (Traub, abstract, Figs. 1-6; col. 1, line 1 – col. 6, line 36).

Traub fails to explicitly disclose wherein the numerical technique is a sparse grid.

Gerstner disclose wherein the numerical technique is a sparse grid (Gerstner, pgs. 209-232).

Intended Use: The claims make intended use statements which do not carry patentable weight (i.e., a device for). What follows the statement of intended use (i.e., "for") does not carry patentable weight. The claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Traub by adopting the teachings of Gerstner to provide wherein the numerical technique is a sparse grid. As suggested by Gerstner, in certain fields (i.e., such as the valuation of derivatives) that use multivariate integrals the use of sparse grids helps to overcome the 'curse of the dimension' (i.e., computing costs growing exponentially with the dimension of the problem).

Response to Arguments

Applicant's arguments have been fully considered but they are not persuasive.

Applicant argues, that neither Traub or Gerstner and Griebel discloses "applying a sparse grid method to determine a plurality of integration points and a plurality of integration weights as a function of the input parameters." Applicant further argues it would not have been obvious to modify Traub by adopting the teachings of Gerstner and Greibel to provide this limitation.

Numerical integration comprises a broad family of techniques for which Monte Carlo, Quasi-Monte Carlo, and Sparse Grids were known to be included. Furthermore, it was known that numerical integration techniques were used in the valuation of financial derivatives.

Traub discloses wherein a Quasi-Monte Carlo technique (i.e., utilizing low discrepancy) provides an improvement over the use of the traditional Monte Carlo technique in the valuation of financial derivatives.

> In securities trading, in setting the initial offering price of a financial instrument, or in later revaluation as financial parameters such as interest rates may change, an estimate of the value of the instrument may be represented as a multi-dimensional integral. For evaluation of the integral, numerical integration is preferred with the integrand being sampled at deterministic points having a low-discrepancy property. The technique produces approximate values at significant computational savings and with greater reliability as compared with the Monte Carlo technique. (Traub, abstract).

Gerstner and Greibel discloses wherein a Sparse Grid technique provides an improvement over the use of the traditional Monte Carlo technique and Quasi-Monte Carlo techniques in the valuation of financial derivatives. Reasons suggested for using sparse grids include:

> We presented generalization of Smolyak's construction which can take into account the smoothness properties of the integrand varying with the dimension."
>
> We have seen that sparse grid quadrature formula's apply very well to many application problems which require the evaluation of multivariate integrals.
>
> From the error bounds in section 4.4 one can expect an asymptotic exponential rate of convergence for smooth functions. This cannot be expected for Monte Carlo and Quasi-Monte Carlo Methods since they cannot take into account the smoothness properties of the integrand.
>
> Furthermore, sparse grid quadrature formulas perform much better than other multivariate quadrature formulas already in the pre-asymptotic range, which is

> important for the practical computation of high-dimensional problems. This superiority of sparse quadrature formulas increases further if higher accuracies are required.
>
> (See Gerstner and Greibel, pg. 229)
>
> See also citations supra.

Applicant argues, "In Gerstner and Griebel, the sparse grid method is used for the CMO model problem which is just a simple financial security, and one of ordinary skill in the art would not be able to transfer this knowledge to the computation of financial derivatives. "

A derivative is a financial instrument whose price is dependent upon or derived from one or more underlying assets. Thus, a collateralized mortgage obligation (CMO) can be treated as a derivative.

It would have been obvious to modify Traub in light of the teachings of Gerstner and Greibel. For example, the following passage from Traub illustrates that CMO's are treated as derivatives:

> The invention relates to financial securities trading such as, e.g., trading in stocks, bonds and financial derivative instruments, including futures, options and collateralized mortgage obligations. (Traub, col. 1, lines 15-20)

Further support for treating CMO's as derivatives is found in Applicant's Specification:

> There are many different kinds of financial derivatives, such as those based on interest rates and/or assets. This includes, among others, bonds, swaps, futures, CMO's, and options. (Applicant's specification, pgs 2).

See also citations supra.

To advance prosecution Applicant should consider the following:

1. From the bibliographic submission provided in response to the 1.105 request, it is unclear whether any of the references pertain to Sparse Grids and their applicability to finance. Failure to submit references is taken as assurance that that none of the references pertain to that subject matter. I

2. Please submit documentation for the formulas cited. As of the time of this Office Action these references had not been submitted.

3. Amending every independent claim to include subject matter not disclosed in or made obvious by the prior art (e.g., formula not previous disclosed).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following references relate to numerical integration and/or valuation of financial derivatives.

("20020065755"|"6061662"|"6304888"|"6772136").PN.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sara Chandler whose telephone number is 571-272-1186. The examiner can normally be reached on 8-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, James Kramer can be reached on 571-272-6783. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SMC

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PRIMARY EXAMINER